

## GROIN INJURIES IN ATHLETES

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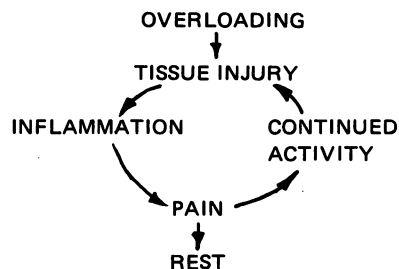
Groin injuries in athletes are being recognised more often in sport, especially in football. In Gothenburg, a study of football injuries, both acute and chronic, revealed that 5% of all injuries were localised in the groin region. Seventeen different teams were studied. Groin pain may be caused by injuries occurring in sports such as soccer, handball, ice hockey, skating, skiing, hurdles, high jump, fencing, bowling, horse-riding, etc., due to overloading of the muscles producing microscopic lesions in the muscles, periosteum, or tendons, and leading to inflammatory reaction. Symptoms may also be caused by complete or incomplete macroscopic lesions, such as disruptions in the groin muscles. Symptoms may be diffuse and uncharacteristic, and it is necessary to establish a broad differential diagnostic background. The most common injuries involve the adductor longus, rectus abdominis, iliopsoas and rectus femoris muscles.

### Tenoperiostitis and Strain of the Adductor Longus

Loading of the adductor muscles during intensive training may lead to injury and inflammation in the region of the adductor origins, especially of the adductor longus. Symptoms often begin insiduously; pain is localised in the origin of the muscle and radiates along the medial aspect of the thigh and also towards the rectus abdominis. The pain and associated stiffness may decrease after some physical exercise and may at times disappear completely. However, the pain usually reappears with greater intensity after continued activity. If the athlete does not rest there is a risk of the so-called "pain cycle" leading to continuous pain. A chronic condition including this pain cycle may be difficult to treat. Clinically there is localised tenderness in the region of the symphysis pubis, and pain is elicited by abduction of the hip joint against resistance. Treatment in the

acute phase consists of ice packs, compression, elevation of the leg and rest. If this initial treatment is successful and if the athlete rests as soon as pain recurs symptoms will disappear rapidly without additional treatment, but if symptoms of a chronic condition persist, rest and heat is indicated, until local tenderness has disappeared and adduction against resistance is painless.

### PAIN CYCLE



*Fig. 1: The pain cycle as often experienced by athletes.*

After 48 to 72 hours heat may be used. Anti-inflammatory medication often is of value. Intravenous Heparin 15,000 i.u. daily for 3 to 5 days may also be used. In long lasting conditions steroid infiltration into the most tender area of the origin may be effective. In chronic cases surgical treatment should be considered. When the injury is healed it is important that the athlete trains the adductor muscles before returning to specialised training. During rehabilitation the athlete should start with isometric exercises without external resistance, followed by dynamic training without load and then isometric training with increasing load,

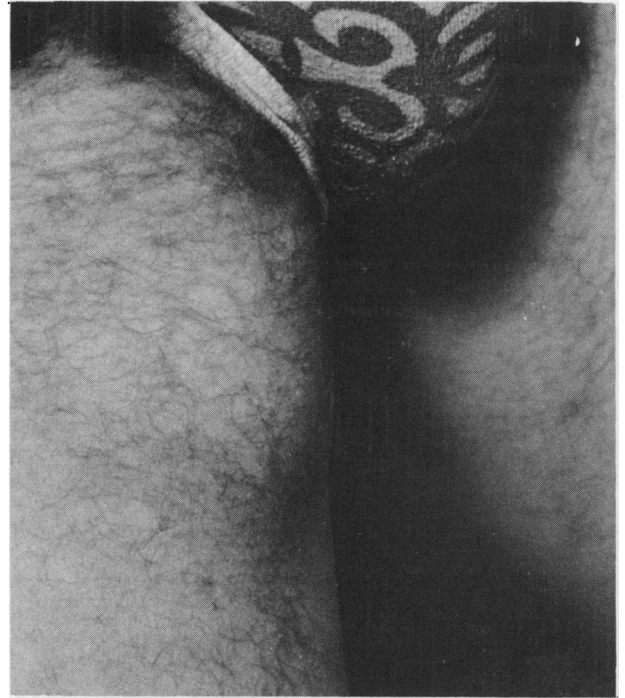
dynamic training with increasing load, then stretching and finally specialised training. Preventive measures are important. Regular isometric and isotonic exercises of the adductors together with flexibility training should be included in every training session and in the warming-up period before competition. In sports where these muscles are used, the trainer should be aware that most competitors have a different level of training, different pain threshold, and different injury risk areas. The trainer and the coach should, therefore, vary the training according to the individual. A strain may be sustained by powerful abduction trauma during simultaneous adduction of the leg, for example, by two players kicking the ball at the same time, by gliding tackles, sharp turning or rapid acceleration, all involving contractions of the adductors. An incomplete disruption, first or second degree strain of the adductor longus is usually located in the musculo-tendinous junction or on the pubic origin. When the pain occurs it feels like a sudden stab with a knife in the groin area. If the injured athlete tries to continue activity this intense pain recurs. Locally there is haemorrhage and swelling which may not be seen until a few days after the injury. If the ability to contract a muscle is lost a complete disruption of the fibres may be suspected, and may be due, as in the six cases reported by Symeonidis (1972), to indirect trauma. Usually it is possible to palpate a tender defect at the location of the disruption. Peterson and Stener (1976) at our clinic reported seven cases of old complete disruptions of the adductor longus at the insertion on the femur. Six of these seven recalled they had sustained an injury while playing football. Complete disruption may occur without causing much discomfort for the average patient, as with ligament injuries. Only one of these seven complained of discomfort during exercise. Five were referred to our clinic with suspicion of soft tissue tumours, as the patients had noticed a growing mass.

This increase in size is probably due to compensatory hypertrophy of the avulsed muscle as it has to work with the disadvantage of a shortened distance between its origin and a new insertion created by scar tissue. Clinical examination must always include analysis of the trauma, inspection, palpation and functional testing with and without resistance.

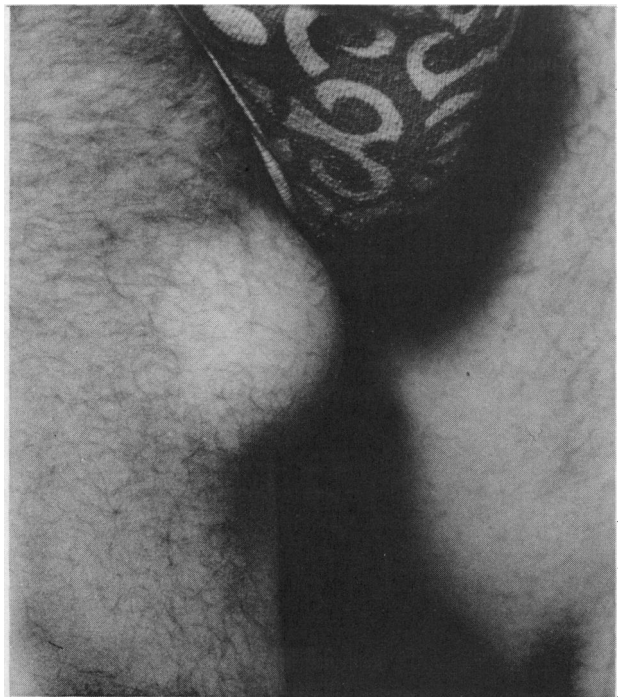
Soft tissue radiography should include tomography. Operative treatment could be considered in a recent complete disruption. Old complete disruptions could be treated conservatively after being differentiated from soft tissue tumours.

#### **Tenoperiostitis and Strain of the Iliopsoas**

The iliopsoas inserts into the lesser trochanter, and is a strong flexor of the hip. Injuries may be sustained by repeated flexing movements at the hip joint or by forceful flexion in the hip joint against resistance.



*Fig. 2a: Examination of a patient with an adductor longus tear with muscles relaxed*

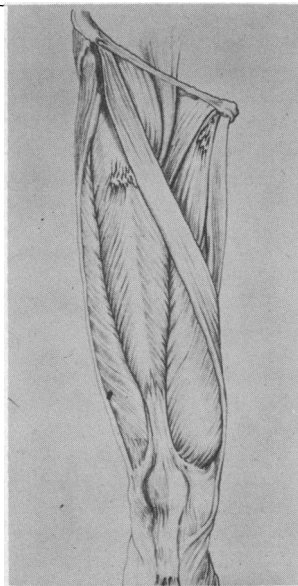


*Fig. 2b: Examination with muscles contracted*

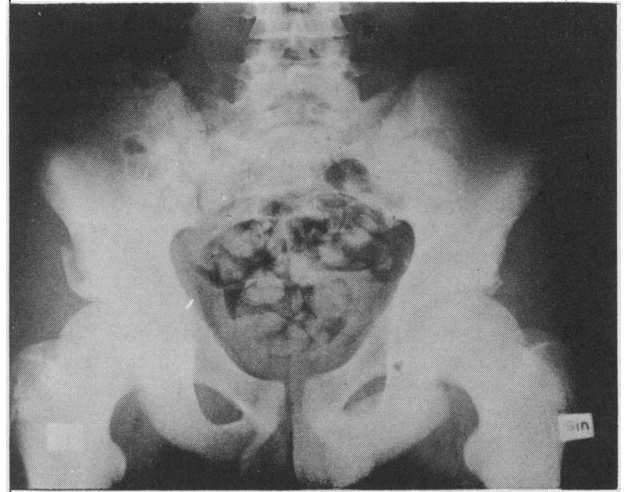
Tendinitis in the iliopsoas may occur after weightlifting, snow-running, running up hills and intensive goal-shooting training in football. The pain cycle, as seen in the adductor longus tenoperiostitis, may also be present here. There is tenderness over the lesser trochanter, difficult to palpate, but may be located by bimanual palpation on the medial aspect of the femur. Pain is elicited by flexing the hip joint against resistance. The treatment is in principle the same as for adductor longus lesions. Incomplete disruptions are usually located at the lesser trochanter or in the musculo-tendinous junction, and often heal with conservative treatment. Complete disruptions are rare, but when diagnosed they could be treated surgically. The differential diagnosis may be difficult and x-rays should be taken to exclude avulsion fractures, tumours, etc.

### The Rectus Femoris Muscle and Tendon

During intensive goal-shooting training in football or in repeated sprinting, pain may be experienced above the hip joint and resisted flexion of the hip and resisted extension of the knee joint give rise to pain just above the acetabulum. Tenderness above the hip joint may be experienced on palpation. Treatment is similar to that of the adductor longus lesions. According to Lotke (1973) the rectus femoris is the muscle in the hip region most susceptible to disruptions and it spans both the hip and the knee joints. For incomplete disruption conservative treatment is to be preferred, but for complete acute disruptions surgical procedures should be considered. X-ray examination may show avulsion of the bony attachment or myositis ossificans.



*Fig. 3. Common sites of complete muscle tears in the adductor longus and rectus femoris muscles.*



*Fig. 4. Avulsion fracture of the rectus femoris origin.*

### Tenoperiostitis and Strain of the Rectus Abdominus Muscle

A more common injury than one suspects and often confused with adductor longus injuries because of the proximity of their pubic attachments. Weightlifting, goal-shooting training, sit-ups, pole vault and tennis may all cause this injury, giving rise to pain during and after exercise. Leg raising against resistance or elevation of the legs and head while lying supine will suggest the diagnosis. Treatment is principally the same as for adductor longus periostitis. A first and second grade strain may be caused by overload. Pain located in the insertion at the moment of injury, followed by recurrent pain when contracting the abdominal muscles, will indicate a strain. Treatment is usually conservative, but in resistant cases surgical procedures may be necessary, such as the excision of granulation tissue and side-to-side repair of the muscle gap.

### Considerations in the Differential Diagnosis

Injuries to other muscles, fractures, hip joint changes, entrapment, hernias, tumours and ureteric calculi. Other muscle groups assisting adduction of the thighs such as gluteus maximus, pectineus and gracilis may also show inflammatory change and strains. Fractures of the femoral neck and in the trochanteric region are comparatively common in elderly people, but are also seen in children and adolescents, usually caused by direct contusion as in skating or ski-ing when falling on ice or hard snow. Fatigue fractures may also occur in the femoral neck and shaft or in the os pubis. They may be seen as overuse injuries in long and middle distance runners and joggers, an increasing problem as interest in these events is increasing.

When pain is elicited by exercise or movement of the

hip joint, especially in combination with pain after exercise, one should not be satisfied with a negative x-ray, but use other diagnostic procedures, and repeat the x-ray after an interval. Avulsion fractures may occur from any of the muscular or tendon regions insertions in the groin area. The most common locations are the anterior superior and inferior spines of the ilium, lesser trochanter and occasionally the greater trochanter.

#### Hip Joint Changes

Four structures around the hip joint may cause pain; the fibrous capsules and its ligaments, the surrounding muscles, the bony periostium and the synovial lining of the joint (Calliet, 1977). Osteo-arthritic degenerative joint disease, a most painful condition, is considered primary when it is a result of ageing alone, but secondary when trauma or disease are involved. Pain in the hip joint may be an early symptom of localised changes in the joint such as arthritis or osteochondritis dissecans. These changes will produce pain with exercise and also afterwards. Pain elicited by rotation in the hip joint requires an x-ray.

The most common cause of painful hip in children is a transient synovitis. This is assumed to be a benign self-limiting condition seen in children under ten, but should be differentiated from serious lesions such as Perthe's disease, osteomyelitis, osteoma, tuberculosis, arthritis, etc. Two extremely important conditions in adolescents are slipped capital femoral epiphysis and osteochondritis dissecans coxae which both will give pain in the groin.

#### Bursitis

There are at least thirteen permanent bursae present in the hip region, between tendons and muscles, and over bony prominences. Pathological conditions in bursae can be classed as traumatic or inflammatory. The traumatic bursa contains blood, the haemo-bursa. The most common cause of haemo-bursa is either direct trauma such as a fall compressing a bursa or indirect trauma through a strain in an overlying tendon with haemorrhage, which will initiate chemical inflammation. If the haemorrhage is heavy and not treated the blood will coagulate and eventually fibrous adhesive tissue and loose fibrous bodies will be formed in the bursa, producing chronic inflammation, inflammatory bursitis with recurrent problems. Treatment of acute haemo-bursa should be immediate evacuation of the haematoma. The superficial trochanteric bursa is liable to direct trauma, with a haemo-bursa as a result.

It is easy to aspirate the blood in the bursa. If the condition becomes chronic surgical excision is the treatment of choice. Inflammatory bursitis may be divided into friction, chemical and infective bursitis. Friction bursitis may be caused by repeated frequent movements of the tendon against the bursa. The ilio-

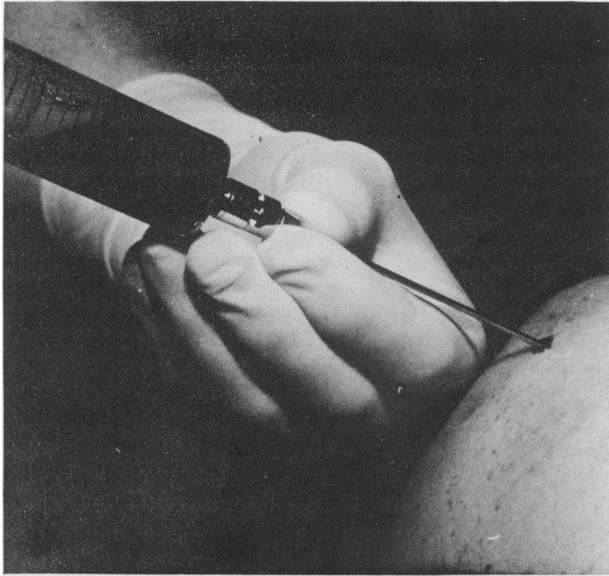
**TABLE I**  
**Pathological Conditions of the Bursae**

TRAUMATIC
HAEMOBURSA
INFLAMMATORY
FRICTION BURSTITIS
CHEMICAL BURSTITIS
INFECTED BURSTITIS
SEPTIC
LOCAL

pectineal bursa is situated in front of the hip joint, it is the largest synovial bursa in the body and communicates with the joint in 15% of adults. This bursa alone may be inflamed or can be combined with iliopsoas tendinitis, and may give tenderness and swelling in the middle of the groin which might spread across the inguinal ligament. If there is a suspicion of bursitis, aspiration of the bursa may give the diagnosis. The trochanteric bursa is situated between the gluteus maximus tendon, and the postero-lateral surface of the lesser trochanter. Bursitis will cause pain and tenderness just posterior to the prominence and the pain can radiate down the outside of the thigh, and be confused with herniated disc lesions from the lumbar spine. Pain may be elicited by rotation of the hip joint. Careful palpation around the posterior aspect of the greater trochanter will cause pain. Local treatment consists initially of cold packs and rest. After the acute phase, cortisone infiltrations might give relief.



*Fig. 5. A. Post-traumatic trochanteric haemobursa.*



*Fig. 5. B. Aspiration of the bursa.*

The chemical bursitis which is sustained after a chemical irritation or after degeneration or inflammation in tendon tissue is not common in the groin. Infective bursitis may be septic, caused by bacterial immigration through lacerated skin and may be seen over the trochanteric region.

#### **Nerve Entrapment**

Peripheral nerves may become entrapped after direct trauma or inflammatory conditions. The ilio-inguinal nerve (T12-L1) transmits sensation from the proximal part of the penis and the base of the scrotum. These sensations may be elicited by intensive abdominal muscle training leading to entrapment of the nerve where it goes through the different layers of the abdominal muscles. Pain in these areas should lead to suspicion of involvement of the nerve, but the intensity and character of the pain vary.

Tenderness in the adductor region may be confused with tenoperiostitis, but the diagnosis could be confirmed by a nerve block with local anaesthesia at the level of the anterior superior iliac spine. Occasionally surgical treatment is necessary. Involvement of the genito-femoral nerve (T12-L1) gives similar symptoms; Westman (1970) has reported seven cases of entrapment of these two nerves. He operated on them and the patients all returned to sport. Injury to the lateral femoral cutaneous nerve may cause neuralgia par-aesthetica.

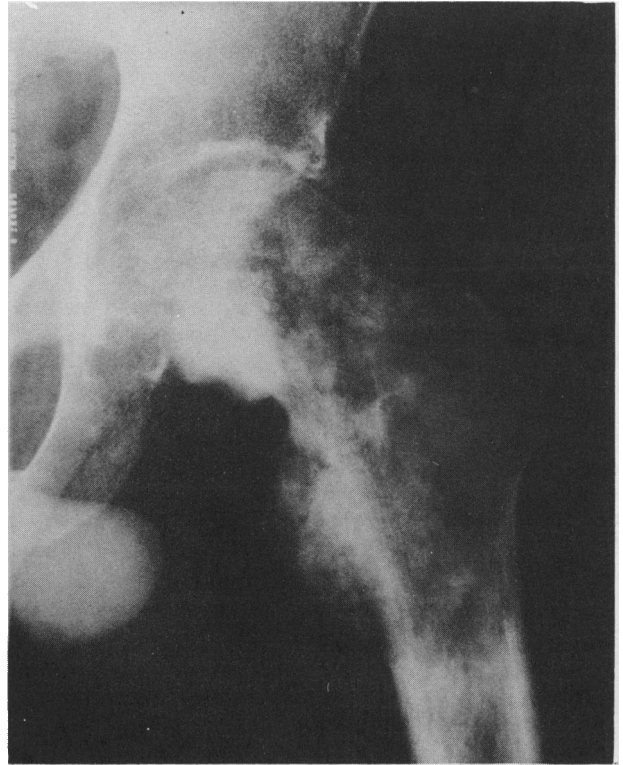
#### **Hernias**

Inguinal and femoral hernias are common and may

produce pain radiating diffusely around the groin. Examination for hernia should be included in all cases of groin pain. Injuries to the abdominal wall have been reported, and may involve the internal and external oblique muscles, and large atypical hernias may be formed. Incipient inguinal hernias may be painful after strenuous physical activity, but it is often difficult to get an accurate clinical diagnosis. Gullmo et al (1977) has described a technique of herniography, using an inter-peritoneal contrast material to visualise incipient hernias, which later have been operated upon with good results.

#### **Intra-abdominal Inflammation**

The iliopsoas muscle may be affected in appendicitis, and the internal obturator muscle may also be irritated by pelvic inflammation, especially a pelvic abscess, which will lead to pain on internal rotation of the hip joint. Prostatitis and urinary infection are not uncommon in young athletes, especially in winter sports, causing pain radiating diffusely around the groin. Rectal palpation should be included in the examination of groin pain. Gynaecological disease may also give groin pain.



*Fig. 6. Tumour in the neck and head of the left femur. Radiograph taken eight months after the onset of pain in a 35 year old footballer, at first attributed to "groin strain". Following hemipelvectomy, the tumour was found to be an osteosarcoma.*

Inflammatory conditions of the sacro-iliac joint are not uncommon in winter sports, and may be part of a general disease like rheumatoid arthritis. Tumours are not uncommon in the groin area and we have seen several cases where the pain was first experienced in the groin during football or similar activity. Several patients have been referred to our clinic because of persistent pain or suspected tumour found on x-ray. We have found osteogenic sarcomas in the groin, as well as benign tumours.

TABLE II

## Follow-up study of the first 55 cases

Adductor longus injuries	34
Rectus abdominus injuries	12
Rectus femoris injuries	3
Inguinal hernias	2
Iliopsoas injuries	2
Trochanteric bursitis	2
Total	55

Most of the injuries were incurred during Association Football, but competition from ice hockey, handball, orienteering and distance running were also seen. All the injuries were of at least five days duration, so were subchronic or chronic, and usually presented after hard training, the "pain cycle".

TABLE III

## Symptoms caused by Groin Injuries in 55 Athletes

	SYMPTOMS			
	M. Adductores (N=34)	M. Rectus Abdominus (N=12)	Hernia (N=2)	Others (N=7)
Pain at Rest	21	4		3
Pain During Exercise	30	9	2	8
Stiffness Initially	19	5		3
Stiffness after Exercise	23	3		5
Stiffness in the Morning	21	5		5
Tenderness	21	4	2	6
Weakness in the Extremity	4	0		3

## Treatment

Treatment of acute groin injuries should start immediately. Most of the athletes in our study of 55 had

symptoms for some time and this is why there were so many alternative treatments tried. Most rested, but could participate in limited activities, avoiding movements giving pain, but general condition could be maintained by cycling, swimming or other methods of training not using injured areas. Ultrasound and hot packs have been used, and some relief experienced. Heparin injection is often used in acute cases, but we have also used it in athletes with more chronic conditions. Infiltration with cortisone has been given only on strict indications to athletes with long-lasting pain. Infiltrations have been made into the most painful and tender areas at the origin or insertion of the tendon and muscle, but *never into the tendon or the muscle itself*, and when combined with rest this may be an efficient treatment providing the diagnosis is correct. Anti-inflammatory drugs have been used especially in diffuse lesions, for 5-10 days and symptoms have become less pronounced, mainly pain and morning stiffness. Muscle training is used during rehabilitation and as prevention against re-injury. The disability time has been long – 50% had pain and discomfort more than 20 weeks after injury. Injuries to the rectus abdominus muscle resulted in longer disability than injuries to the adductor longus.

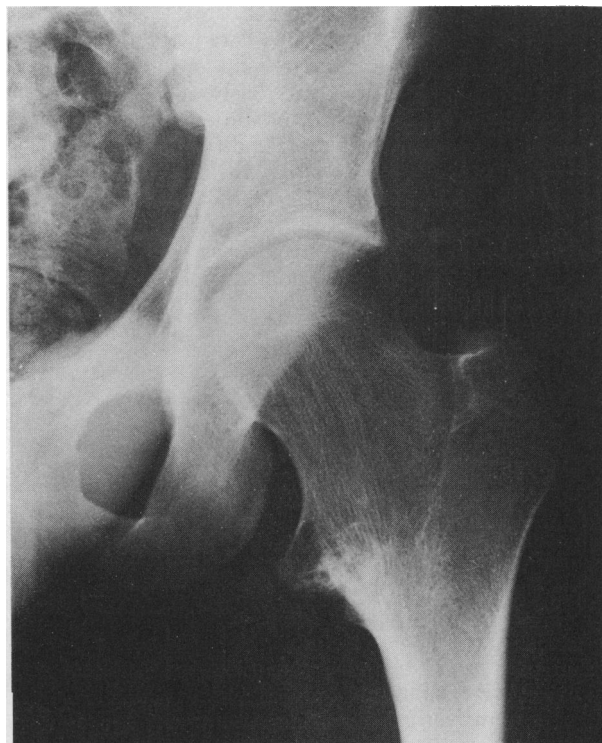


Fig. 7. A. Tumour in the lesser trochanter region, impinging upon the iliopsoas muscle, in a nineteen year old oarsman unable to flex his hip fully.



Fig. 7. B. After excision of the cartilagenous extosis. Full recovery.

Groin injuries in athletes are becoming more common, giving the athlete and his doctor great problems. They are difficult to diagnose, symptoms may be very diffuse and uncharacteristic and, therefore, it is necessary to establish a broad differential diagnostic background. They are very difficult to treat, so prevention is of utmost importance and if an injury is sustained, correct diagnosis and rapid and correct treatment is essential. Groin injuries constitute a real challenge to sports medicine doctors.

TABLE IV

Treatment Methods of Groin Injuries in 55 Athletes

	TREATMENT		
	M. Adductores (N=34)	M. Rectus Abdominus (N=12)	Others (N=7)
Rest with Limited Activity	25	9	7
Heat	14	7	7
Injection of Heparin	8	4	
Injection of Cortison	16	6	6
Anti-Inflammatory Drugs	21	8	3
Muscle Training	29	8	3
Operation		1	
Ultrasound	8	2	2

TABLE V

Time of Healing after Groin Injuries in 55 Athletes

	TIME OF HEALING		
	M. Adductores (N=34)	M. Rectus Abdominus (N=12)	Others (N=7)
Less than 1 Week			
1-4 Weeks	8	3	1
5-8 Weeks	6	3	1
9-12 Weeks	4	1	1
13-20 Weeks	2		
More than 20 Weeks	14	5	4

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